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ABSTRACT

The study looked at the relationship between gifted students' sense of self-efficacy to their decisions to undertake independent investigations. It also examined whether efficacy beliefs, gifted behavior, or both could be increased by participation in a mini-course on research methodology. The literature on self-efficacy theory is reviewed showing that self-efficacy has been shown to be an effective predictor of engagement in subsequent behavior in a variety of areas. Subjects (N=294) were in grades 4 through 8 and participating in a Triad/Revolving Door Identification Model of gifted education. Students participated in a four lesson mini-course. Students' sense of efficacy was measured by a researcher-developed "Efficacy Scale for Overall Creative Productivity." Results generally supported the self-efficacy causal model. The greatest influence on post-treatment self-efficacy was initial self-efficacy. Participation in the mini-course had a significant but negative effect on self-efficacy. Self-efficacy was linked with initiation of independent investigations. (DB)

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# CREATIVE PRODUCTIVITY AND SELF-EFFICACY IN GIFTED CHILDREN

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Throughout history society has defined its gifted members by their creative productivity (Renzulli, 1978). In contrast, educators have continued to identify children for gifted programs by their lesson learning abilities, through the use of I.Q. and achievement tests, grades, teacher ratings, and other school-related measures. Another difference is that many other approaches in gifted education see giftedness as a stable and enduring characteristic, while the Triad/Revolving Door Identification Model (RDIM) looks instead at gifted **behavior** and ways in which programs can increase the likelihood that students will engage in such behaviors (Renzulli, 1977; Renzulli, Reis, & Smith, 1981; Renzulli & Reis, 1985). Believing that creative productivity is developmental--and developable--the model includes activities designed to directly promote gifted behavior in a larger number of students than are traditionally served by gifted programs. The goal is to help students discover interests, develop skills, and gain experience as creative producers, in the belief that they will continue and improve upon these behaviors as they move into adulthood.

This focus on children's creative productivity will not only contribute to the overall level of gifted behavior in our society, but will also enhance the self-fulfillment of individual students. Success at real-world accomplishments brings an increased sense of efficacy, pride, and self-confidence...the realization that one can make a positive difference in the world. This orientation toward creative productivity addresses a major concern in the field of gifted education, namely the unfulfilled potential of students and the frustration that can accompany it.

In the years that the Triad/RDIM program has been in use, many students have demonstrated creative productivity through the investigation of real world problems in areas of personal interest (called Type III projects). Other students have not chosen to engage in such behaviors. Since the goal of the program is to increase the likelihood that more students will engage in such behaviors, it is important to understand the factors that influence such decisions. This knowledge will allow us to design and test interventions that can increase the number of individuals who become creative producers and, by doing so, contribute to our society and culture as well as their own self-fulfillment.

Self-efficacy theory provides a framework that is potentially applicable to the investigation of this situation. Self-efficacy measures predict subsequent behavior, and the theory explains how decisions to undertake and persevere at a behavior are related to expectations of success or failure in that situation and how these expectations can be influenced.

## Objectives

This study investigated the relationship of students' sense of self-efficacy as creative producers to their decisions to undertake independent investigations (Type III). In addition, it tested

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whether efficacy beliefs, gifted behavior, or both could be increased by participation in a mini-course on research methodology. As a result, the research on self-efficacy has been extended to new populations and target behaviors and educators are in a better position to help students become creative producers.

The following research questions guided the study:

1. To what extent and in what manner can variation in the undertaking of independent investigations be explained by the following variables: grade level, sex, years of participation in the Triad gifted program, previous Type III projects completed, and participation in the treatment?
2. What is the nature of the relationship between measures of student self-efficacy as creative producers and the following personal and situational variables: grade level, sex, years in the Triad gifted program, previous Type III projects completed, initial self-efficacy, participation in the treatment, and involvement in a Type III ?
3. What is the nature of the relationship between number of Type III projects initiated after the treatment and the following variables: grade level, sex, years in the Triad gifted program, previous Type III projects completed, initial self-efficacy scores, participation in the treatment, and post-treatment self-efficacy scores?

## Review of Related Literature

### Triad/RDIM Approach to Gifted Education

Research about gifted individuals, those who have made significant and often unique contributions to society, has shown that they bring the traits of above average ability, creativity, and task commitment to bear upon an area of personal interest (Renzulli, 1978). Renzulli's Triad/Revolving Door Identification Model encourages students to investigate real problems and come up with original research, performances, or formats for the presentation of new knowledge in order to think and act like creative producers.

The Enrichment Triad Model (Renzulli, 1977) is a system for the encouragement and development of these behaviors. Three types of enrichment activities are designed to increase the quantity and quality of creative productivity among children. Type I activities are general exploratory ones, designed to introduce students to topics, questions, and areas of potential interest, the rationale being that they cannot pursue areas about which they are unaware. Type II activities train students in the processes necessary to carry out successful investigations. These may include general skills like creativity, critical thinking, problem solving, use of advanced resources, varying modes for communicating results, and others. They may also include more specific training in the methodologies of the practicing professionals so that students are able to approach their investigations in a more sophisticated and professional manner. Type III enrichment consists of the investigation of real problems and/or production of new knowledge, formats, or artistic creations in an area of interest to the student. It is a form of gifted behavior, namely creative productivity, on the part of students (Renzulli & Reis, 1985).

Research support. Much research documents the ability of

students to develop and exhibit gifted behavior within the context of gifted programs designed for that purpose. A study by Reis and Renzulli (1982) found that students in the top 20% of eleven elementary schools using the Triad/RDIM model produced quality projects, with no significant difference in quality between projects of students in the top 5% (traditional participants in gifted programs) and the next 10-15%. Delisle and Renzulli (1982) found that non-intellective factors were important in creative production and also verified earlier research related to a conception of giftedness as above average ability, creativity, and task commitment. In studying creative productivity, Gubbins (1982) found that important factors included student interests, task and time commitment. Her results also indicated that above average ability was necessary but not sufficient for high level productivity.

From a post-hoc perspective looking at experiences highly successful space scientists regarded as significant in their development, Scobee and Nash (1983) found "the one receiving the highest percentage selection (66%) as well as recommendation (65%) on the basis of being important for students was 'hands-on' experiences in or out of school, such as opportunities to use scientific equipment such as telescopes, microscopes, computers; to fly airplanes, to design or build models such as telescopes or airplanes; or to write for an audience" (p. 148). This supports the premise of this research that experiences with the how-to of creative productivity can lead to subsequent demonstration of those skills in self-chosen activities.

Self-efficacy Theory

Definition. The construct of self-efficacy was introduced by Albert Bandura (1977). It is part of the larger concept of social learning theory, and as such, reflects Bandura's view that "psychological functioning involves a continuous reciprocal interaction between behavioral, cognitive, and environmental influences" (Bandura, 1978, p. 344). Self-efficacy represents an individual's level of confidence at doing a particular behavior. It is said to be specific to a particular activity or situation, in contrast to global beliefs like self-concept or locus of control. Bandura believes that a "global view of what people think of themselves cannot possibly account for the wide variations they typically show in their self-reactions under different situational circumstances, on different activities, and at different times" (Bandura, 1978, p.348). Some studies, however, support the generality of the construct (Baum, 1985; Stedtnitz, 1985).

Efficacy beliefs influence whether the particular behavior will be attempted, the amount of effort that will be expended, and the degree of perseverance in the face of difficulty. They act in a reciprocal or cyclical fashion. Those individuals with high self-efficacy regarding a particular behavior are more likely to attempt that behavior, exert more effort, and persist in the face of difficulties. This in turn increases the likelihood that they will succeed, and subsequent success increases their confidence at doing that behavior. In the negative instance, individuals with low self-efficacy, exhibiting less intensity and persistence of effort, are less likely to succeed, thus reinforcing their lack of confidence and making it less likely that they will attempt the behavior in the

future. Locke, Frederick, Lee, and Bobko (1984) found that ability, self-efficacy, goals, and task strategies were all related to performance of the target behavior, and suggest that self-efficacy may be the link between social learning theory and goal-setting approaches to explaining task performance.

Sources of efficacy beliefs. There are four sources of information upon which people base self-efficacy judgements. These are performance accomplishments, vicarious experiences (model learning), verbal persuasion, and emotional/physiological arousal, in descending order as listed (Bandura, 1977, 1981). Keyser and Barling (1981), however, found that modeling was a more powerful influence on the self-efficacy beliefs of the children in their study, and hypothesized that the influence of various contributors to self-efficacy may vary with the age of the subjects.

Performance accomplishments are the record of successes or failures with the particular behavior or behaviors similar to the target behavior. Research with adult snake phobics (Bandura, Adams, & Beyer, 1977) showed higher, stronger, and more generalized self-efficacy expectations for the treatment condition using performance accomplishments than for vicarious experiences or the control group.

One caution about the effect of performance accomplishments on self-efficacy is the observation by Goldfried and Robins (1982) that there may be a difference between objective performance accomplishments and the subjective perception of them by the individual involved. Their observation in the counseling setting is that clients' subjective evaluations had a greater influence on self-efficacy expectations than did objective performance when there was a difference between the two. Nonetheless, performance accomplishments are important because a history of success, real or perceived, creates a positive sense of efficacy that can enable people to withstand occasional failures.

A second source of efficacy information is vicarious experiences, observing others' attempts and outcomes in the carrying out of the target behavior. Success of similar others engenders higher feelings of self-efficacy, while learning about others' failure can lead to lower efficacy expectations on the part of the subject (Bandura, 1982).

Bandura found the other two sources of self-efficacy much weaker. One is verbal persuasion, telling the subject that he is capable of performing the behavior. Without experience, either actual or vicarious, the subject's belief of the verbal persuasion depends mainly on the speaker's credibility (Bandura, 1977). The fourth influence is physiological/emotional arousal, which usually accompanies stressful or fearful situations. Because this kind of emotional arousal (stress, anxiety) usually has a negative impact on performance, people feel more confident about their abilities when they are not experiencing these feelings (Bandura, 1977; Bandura, Adams, & Beyer, 1977).

Age/gender differences. In his experimental work, Bandura has not reported any differences in self-efficacy with respect to gender. These differences have been reported in other work (Betz & Hackett, 1981; Hackett, 1985; Yakimowski & Owen, 1986) and may relate more to the particular behavior under study than to self-efficacy itself.

Research with children has shown some differences in self-efficacy related to age, with younger children reporting higher self-efficacy than older children. Yakimowski & Owen (1986) suggest that as students get older, life (and school) gets tougher, and that the relatively fewer successes may lead to a more realistic sense of academic self-efficacy. Kaley and Cloutier (1984) argue that students' self-efficacy judgments get more accurate (and consequently lower) as they move through the pre-operational, concrete, and formal operational stages of development.

Summary

Self-efficacy has shown to be an effective predictor of engagement in subsequent behavior in a variety of areas. There is evidence that efficacy expectations can be increased through interventions involving performance accomplishments and modeling, and that subjects are more likely to engage in the target behavior as a result of such treatment. In light of these findings, the hypothesis of the current study is that number of previous Type III's (performance accomplishments) and years in the Triad gifted program (vicarious experiences) will be significant predictors of students' self-efficacy as creative producers. It is further hypothesized that involving students in successful performance accomplishments (through participation in a research mini-course) will lead to increases in self-efficacy as creative producers and subsequent initiation of such projects.

## Methods and Procedures

Sampling Technique

The subjects of this study were students in grades four through eight in eight schools using the Triad/Revolving Door model for gifted education. These settings were chosen because creative productive behavior is the goal of Triad programs and Type III projects offer an objective measure of creative productivity. In order to test whether postulated increases were due to the treatment or simply encouragement of creative productivity, it was necessary to use subjects already in settings supportive of creative productivity, and few non-Triad schools offer opportunities for students voluntarily to demonstrate this type of behavior. If students receiving the treatment then chose to start more Type III's than students receiving the usual activities, a particular treatment effect will have been demonstrated for the research methodology mini-course. Thus the control group in this study was designated as students receiving all of the services of Triad programs except the experimental mini-course.

Students involved in this research were all members of the Talent Pool or Talent Pool classes. Talent Pool membership is based upon above average ability (in school work or a particular area of talent) and either demonstrated or potential creativity and task commitment. Most students in the sample scored above the 85th percentile on standardized tests, making this sample one of above average though not necessarily superior ability students. For the most part, these students had participated in gifted program activities in their schools in the past.

The number, grade level, and schools of students involved in both treatment and control groups are summarized in Table 1. With one

exception, treatment and control groups were identified within each school to control for differences based on teacher or school. In one case the same gifted teacher served two very small schools in the same district; the Talent Pool of one was designated a treatment group and the other a control. Because of the scheduling requirements of the schools, students in intact groups at each school were designated as treatment and control groups.

T-tests showed no significant differences between treatment and control groups with respect to sex, previous Type III's completed, years in the Triad gifted program, or number of Type III's initiated before the beginning of the mini-course. In addition, none of these variables were significant predictors when a stepwise multiple regression was run using treatment group as the dependent variable.

Procedures

Students in the treatment group participated in a four lesson mini-course on research methodology covering the topics of research questions, hypotheses, variables, sampling, data collection (surveys, interviews, experiments), data analysis, and conclusions. They carried out each of these activities through participation in a group research project. Students in the control group received the process skill training normally taught in that school's gifted program. This usually consisted of training in techniques such as creativity, critical thinking, problem solving, library research, and other enrichment activities.

All students continued to receive the usual services of a Triad program. They were exposed to a variety of topics and areas of interest designed to introduce them to areas they might want to explore further. Teachers in the gifted program and the regular classroom encouraged students to follow up on areas of interest and suggested Type III's that students might want to pursue. Students in both treatment and control groups had the opportunity to initiate Type III independent investigations at any time during the school year and were aware of the procedure for doing so.

To determine if the treatment increased the creative productivity of students, comparisons were made between the number of students in each group who initiated Type III projects between the start of the mini-course in the fall and the end of the school year. April was designated the "end of the school year" as far as initiating Type III's because past experience indicated few if any students started projects after this time.

The second part of the study was ex post facto, exploring variations in student self-efficacy as they correlated with grade level, sex, years in the Triad gifted program, previous Type III's completed, participation in the treatment, involvement in a Type III, and self-efficacy scores at other points in the study. Students in both treatment and control groups completed ratings of self-efficacy as creative producers before the mini-course, immediately following the mini-course, and at the end of the school year (June) using instruments developed and pilot tested by the researcher. Data on years of participation in gifted programs and number of past Type III's completed were also collected in order to investigate the effect of these personal variables in the causal model.

The third part of the study integrated the two earlier parts with an ex post facto investigation of variables related to students'

decision to begin a Type III investigation after the start of the mini-course. Data from those students who had not initiated a Type III project before the start of the mini-course (n=161) were examined to investigate the ways in which initiation of Type III's was influenced by pre-treatment factors of grade level, years in the Triad gifted program, and previous Type III's completed, by the treatment itself, and by changes in self-efficacy resulting from participation in the treatment.

Instrument Development

In order to measure students' sense of efficacy as creative producers, the Efficacy Scale for Overall Creative Productivity (ESOCreP, Appendix A) was developed. This six item scale attempted to measure students' self-efficacy at completing a Type III project, a term familiar to all students involved in the study. The scale was administered to a sample of 294 students in grades four through eight currently participating in gifted programs based on the Triad model.

Alpha internal consistency of the ESOCreP at the first administration was .70. The second administration, given to a subsample of the same students approximately six weeks later, yielded an alpha of .77 and test-retest reliability of .56. This relatively low stability estimate indicates that the ESOCreP is not as reliable over time as would be desired and that there will be some degree of error in the measurement of self-efficacy using this instrument. The degree of error variance in the ESOCreP may obscure or reduce the relationship of self-efficacy to other variables in statistical procedures used. Correlations reduced by measurement error provide less systematic variance available for analysis in the regression procedures, resulting in reduced or obscured relationships among the variables under investigation. Reasons for the low stability reliability will be explored in the discussion section of this paper.

## Data Analysis

Research Question #1

Hierarchical multiple regression analysis was used to explore the first research question concerning the effect of a number of variables on initiation of independent investigations. Changes in the multiple R at each step were checked for significance using the F test, $p<.05$. The dependent variable was the number of Type III projects initiated after the mini-course began. Independent variables of grade and sex were entered first to determine the effect of variables over which gifted programs have little control. The next set of variables, years in the Talent Pool and number of previous Type III's, represent those variables that are more long term in nature and therefore under some control by gifted programs. Group membership was then added, to determine if participation in the mini-course had explanatory power beyond that of the previously entered variables.

Research Question #2

The second part of the study used path analysis in order to "trace the sequential cause and effect network of relationships assumed by the cognitive model" (Covington & Omelich, 1979, p. 1488). This also made it possible to investigate relationships among the predictor variables. Figure 1 depicts the causal pathways of influence suggested by self-efficacy theory as applied to the

creative productivity of children involved in Triad gifted programs.

Rationale for the postulated causal model. Number of previous Type III projects is the variable representing Bandura's construct of performance accomplishments, as this indicates students' previous history with the behavior under study (initiation of a Type III project this year). Years in the Talent Pool is an indicator of the amount of time students have been exposed to the modeling of Type III behavior by other children, as well as the verbal persuasions of the teacher of the gifted toward that end. According to self-efficacy theory these variables should show a positive and significant relationship to initial self-efficacy. Research to date has reported mixed results about the effect of grade and sex on self-efficacy, so those variables were included for exploration.

Initial self-efficacy can be assumed to be related to later measures of self-efficacy. Bandura claims that, without intervening experiences, self-efficacy is fairly stable. Post-treatment self-efficacy represents any changes in self-efficacy judgements as a result of participation in the treatment, which was designed to increase self-efficacy. Bandura's theory also suggests that participation in a Type III should increase self-efficacy, as successful performance of a behavior should lead to increased confidence in one's ability to perform that behavior.

Previous experience in gifted programs based on the Triad model indicate that years in the program, number of previous III's completed and grade level are related to student initiation of subsequent Type III's; therefore those paths have been included for testing in the causal model in addition to the paths postulated for self-efficacy.

Statistical analysis. The causal model was tested by using stepwise multiple regression on a successive set of variables. The first regression used final self-efficacy as the outcome variable and all variables postulated to contribute to its variation as predictor variables. Moving to the left in Figure 1, each variable in turn served as an outcome variable, with those variables postulated to contribute to its influence serving as predictor variables. All endogenous variables (those caused by other variables in the model) served as outcome variables. The exogenous variables (grade, sex, years in the Talent Pool, previous III's) were not used as outcome variables as it is assumed they are not caused by other variables in the model.

Beta weights from the various analyses were examined. Where the path coefficients were less than .05, paths were eliminated from the model. The regression was re-run, testing paths that had been retained. The $R2$ of the trimmed model, which included only those paths with significant beta weights, was then compared to the $R2$ of the original model. If the F test indicated no significant reduction ($p<.05$) in overall variance accounted for, the trimmed model was accepted as the most parsimonious explanation.

Research Question #3

The third part of the study also used path analysis to assess the direct and indirect contributions of the variables under examination to the initiation of Type III projects after the start of the treatment. Figure 2 depicts the causal pathways of influence suggested by self-efficacy theory and past experience with Triad

gifted programs as applied to creative productivity after treatment.

Rationale for the causal model. Number of previous Type III projects represents Bandura's construct of performance accomplishments. Years in the Talent Pool is an indicator of the amount of time students have been exposed to the modeling of Type III behavior by other children, as well as the verbal persuasions of the gifted teacher toward that end. According to self-efficacy theory, these variables should show a positive and significant relationship to self-efficacy and subsequent performance of the behavior (Type III's).

Experience with Triad programs has indicated relationships between grade level and initiation of Type III's, with older students more likely to start a Type III than younger students at the elementary level, and students at the secondary level less likely to start Type III's. Because the current sample included both elementary and secondary students in grades four through eight, the influence of grade level on Type III initiation is unclear and was included for investigation. Previous evidence is also unclear about differences between boys and girls in participation in Type III projects. For this reason, and because it is part of earlier analyses, it has been included in the analysis.

The treatment was designed to teach the skills of research methodology and to increase students' sense of self-efficacy by allowing them to successfully participate in some of the behaviors associated with original research. For these reasons participation in the treatment is expected to positively influence both self-efficacy as creative producer and the initiation of Type III projects. Finally, this part of the study tests whether students' self-efficacy as a creative producer influences initiation of Type III projects, as Bandura's theory suggests it should beyond that of other relevant variables.

Statistical analysis. The causal model was tested using stepwise multiple regression on a successive set of variables in the manner described in the previous section, using similar procedures for trimming the model.

## Results

### Research Question 1

The first research question investigated to what extent and in what manner variation in the undertaking of independent investigations is explained by the following variables: grade level, sex, years of participation in the Triad gifted program, previous Type III projects completed, and participation in the treatment. Data from students who had not started a Type III prior to the treatment were used in a hierarchical multiple regression procedure.

The dependent variable was number of Type III's started after the beginning of the treatment. The independent variables of grade level and sex were entered as a block at step 1 and yielded a multiple R of .2325, significant at the .01 level. At step 2, years in the Talent Pool and number of previous Type III projects were entered as a block. The multiple R increased to .4026, with an F test indicating a significant increase ($p<.001$) in the degree of variance explained. At step 3 treatment was entered, to determine if participation in the research methodology mini-course had explanatory power beyond that of

the previously entered variables. The addition of the treatment variable increased the multiple R to .4163, with the F test indicating an increase in variance ($p<.15$) explained by the regression equation. Table 2 contains the results of the regression analysis.

Grade and sex appear to explain about 5% of the variance in starting of Type III projects by students who had not started them prior to the teaching of the mini-course. When years in the Talent Pool and previous Type III's completed were entered, the amount of explained variance increased to 16%. Both variables have high simple correlations with the dependent variable. It is also logical that past participation in activities related to Type III's would be associated with current participation.

The addition of treatment does not add significantly to the amount of variance beyond that explained by previously entered variables. This suggests that participation in the treatment group did not significantly influence students' decisions to start Type III's after the mini-course began. The regression equation containing all five variables accounts for only 17% of the variance, so it seems that other factors influence the decision to initiate a Type III. Research question 3 further addresses this, investigating self-efficacy and these variables in a causal model.

Research Question 2

The second research question explored the nature of the relationship between measures of student self-efficacy as creative producers and the following personal and situational variables: grade level, sex, years in the Triad gifted program, previous Type III projects completed, initial self-efficacy, participation in the treatment, and involvement in a Type III. In all analyses standardized beta weights were examined, with .05 used as the criterion for retention in the trimmed model. These were then entered as path coefficients in the postulated path model depicted in Figure 3 and the trimmed path model in Figure 4.

Predictors of final self-efficacy. Scores on the ESOCreP administered at the end of the school year were regressed against participation in Type III's, ESOCreP scores at the end of the treatment, and ESOCreP scores before treatment began. The results of the analysis are reported in Table 3. The multiple R was .7542, with an $R2$ of .5689. This indicates that approximately 57% of the variance in final self-efficacy can be explained by differences in earlier measures of self-efficacy and participation in a Type III.

The strongest predictor of final self-efficacy was post-treatment self-efficacy, accounting for 48% of the variance. This fits the commonly held belief in educational psychology that the best predictor of anything is an earlier measure of the same thing. It may also reflect influences of the treatment on both post-treatment and final self-efficacy measures.

The next predictor was participation in a Type III, accounting for an additional 7% of the variance in final self-efficacy. Involvement in a Type III significantly increased prediction of final self- efficacy scores ($p<.001$) beyond the variance accounted for by post-treatment efficacy. Those who participated in a Type III ended up feeling more confident of their abilities to do Type III's, supporting Bandura's theory that performance accomplishments have a

direct effect on self-efficacy.

The third predictor, self-efficacy measured before the treatment began, accounted for another 2% of the variance. When simple correlations are examined (see Table 4), it is clear that much of the variance shared between the initial and post-treatment self-efficacy measures entered in the first step of the regression, leaving little to enter at this third step.

Predictors of participation in Type III's. The dependent variable in the next stepwise multiple regression was the number of Type III's participated in during the school year, whether begun before or after the start of the treatment. Independent variables included grade, sex, previous Type III's completed, years in the Triad gifted program, and post-treatment efficacy scores. The multiple R for this regression was .4119, with an R2 of .1696. Results of the analysis are reported in Table 5.

The first variable to enter as a predictor of Type III's was previous III's, a performance accomplishment in Bandura's terminology. The next predictor to enter was self-efficacy, significant at the $p<.0001$ level, indicating that estimations of one's ability to do a behavior are significant predictors of actually doing that behavior.

Other variables providing explanations for Type III's were grade, sex, and years in the Talent Pool, though none provided significant ($p<.05$) increases in variance explained beyond the first two variables to enter. Self-efficacy theory suggests that years in the Talent Pool, providing opportunities for model learning and verbal persuasion, ought to be a significant predictor of Type III initiation. Since the correlation of years in the Talent Pool and previous III's is high ($r=.77$), it is likely that the variance shared by these two variables entered the regression equation in step 1, leaving little to attribute to years in the Triad gifted program.

Though not significant, the influence of grade on starting of III's favored younger students, which is consistent with experience in Triad programs. Results for sex, also non-significant, favored females. That 83% of the variance in starting of Type III's is unexplained by the causal model indicates that further research is needed to more accurately understand factors associated with the decision to undertake Type III's.

Predictors of post-treatment self-efficacy. Scores on the ESOCreP administered after the end of the research methodology mini-course were regressed against ESOCreP scores before the mini-course and treatment group in an attempt to determine the effects of the treatment on self-efficacy. Results are reported in Table 6. The multiple R was .7049, with an R2 of .4969. Approximately half of the variation in post-treatment self-efficacy can be explained by initial efficacy and treatment group.

The fact that post-treatment self-efficacy provided the greatest contribution to initial self-efficacy is not surprising. The best predictor of something is usually an earlier measure of the same thing; the relatively short time between measures (six weeks) would also make it likely that scores would be strongly related. The negative correlation of efficacy with treatment group is somewhat of a surprise, since the treatment was designed to increase students' self-efficacy as creative producers. Possible explanations will be

discussed in a later section.

Predictors of initial self-efficacy. Scores on the ESOCreP administered at the start of the treatment were regressed against grade level, sex, years in the Talent Pool, and previous Type III's completed in order to determine factors that contribute to self-efficacy as a creative producer before interventions are attempted. Results of that regression are reported in Table 7. With all variables entered in the equation, a multiple R of .1328 was obtained, with an R2 of .0176. Approximately 2% of the variance in initial self-efficacy was accounted for by grade level, sex, years in the Talent Pool, and previous Type III's completed.

When the significance standard of .05 was applied to the standardized beta weights, years in the Talent Pool did not meet the criteria, with a beta of .026. The regression was run again without this variable, and a multiple R of .1715 was obtained. Results of this regression are shown in Table 8. The F test was used to compare the two R2's. The trimmed model did not account for significantly different variance than the postulated model (F=.028, n.s.). Therefore the trimmed model was accepted as the more parsimonious explanation.

Discussion of research question 2. While the predictions of self-efficacy theory were not disconfirmed, the relationship between initial self-efficacy and previous performance accomplishments is weaker than would be expected. The low R2 indicates that the variables in the equation did not account for a significant amount of the variance in initial self-efficacy. Previous III's, as a performance accomplishment, would be expected to contribute to feelings of efficacy. While the relationship is a positive one, the magnitude is small. Because years in the Talent Pool correlates .75 with previous III's and .40 with grade, it is likely that the shared variance entered with those other variables, leaving little to enter on step 4. Previous research is ambiguous about the effects of age and sex on self-efficacy. The small contribution from grade indicates that younger students tend to have higher efficacy, which is consistent with results from others who have found age differences.

Research Question 3

The third research question investigated the nature of the relationship between number of Type III projects initiated after the treatment and the following variables: grade level, sex, years in the Triad gifted program, previous Type III projects completed, measures of self-efficacy, and participation in the treatment. Students who had started Type III's before the mini-course were not included in the data set, as the intent was to examine the set of variables with respect to their influence on stimulation of Type III's. This question also integrated the two previous research questions dealing with participation in the treatment and influences of self-efficacy. It tested the simultaneous influences of treatment and self-efficacy on motivating students toward creative productivity in the form of Type III projects.

In all analyses standardized beta weights were examined, with .05 used as the criterion for retention in the trimmed model. Figure 5 illustrates the postulated causal model, with standardized beta weights entered as path coefficients. Figure 6 shows the trimmed

model, and includes path coefficients taken from the regression procedures testing the trimmed model.

Predictors of starting a Type III after treatment. Number of Type III's (0 or 1) started after the beginning of the mini-course was regressed against grade, sex, previous Type III's completed, years in the Triad gifted program, participation in the treatment, and post-treatment ESOCreP scores. This was done in order to test the causal model integrating the influences of treatment and self-efficacy on the decision to start Type III's later in the year. Results of the initial regression are presented in Table 9.

With all variables entered in the equation, a multiple R of .4400 was obtained, with an R2 of .1936. About 20% of the variance in undertaking of Type III's after treatment was explained by grade, sex, years in the gifted program, previous Type III's, treatment, and post-treatment self-efficacy.

When standardized beta weights were compared to the criterion of .05, those of grade (.033) and years in the Talent Pool (.004) were not sufficient. These paths were eliminated from the causal model and the regression run again with the remaining predictor variables. Results of the second regression are shown in Table 10. The regression on the trimmed model yielded an R of .4407, with an R2 of .1942. The F test showed no reduction in degree of variance explained, so the trimmed model was accepted as the more parsimonious.

The strongest relationship was that between Type III's after treatment and previous III's. The more Type III's a student had done in the past, the more likely he was to start one now. Post-treatment efficacy contributed in a positive way ($p<.15$) to the dependent variable, indicating that those with higher efficacy are more likely to engage in the behavior. Other non-significant contributors were sex (favoring females) and treatment (favoring participants in the mini-course).

When all other factors in the model were taken into account, treatment contributed 5% of the change in initiation of Type III's. While this did not have statistical significance, it may have practical significance, particularly if participation in the mini-course can be shown to yield other benefits.

Years in the Talent Pool and grade were trimmed from the model because their path coefficients were less than the .05 set as the criterion for retention in the causal model. Because of the high correlations between previous III's and both years in the Talent Pool ($r=.80$) and grade ($r=.44$), it is likely that variance shared between these variables entered on the first step. This might account for their non-significant contribution to prediction of Type III initiation.

Predictors of post-treatment self-efficacy. Scores on the ESOCreP administered after the research methodology mini-course ended were regressed against ESOCreP scores before the mini-course and treatment group in order to determine contributors to post-treatment self-efficacy, in particular the effects of the treatment. Results are reported in Table 11. The multiple R was .6193, with an R2 of .3836, indicating that approximately 38% of the variance in post-treatment self-efficacy can be explained by initial efficacy and participation in the treatment.

The greatest contributor to variance in post-treatment self-efficacy was initial efficacy, measured six weeks earlier. Additional explanation of variance comes from treatment group, though not in the way in which it was expected. Treatment had an inverse effect on efficacy, with those in the treatment group tending to have lower scores on efficacy after the treatment than those in the control group. Reasons for this will be discussed in a later section.

Predictors of initial self-efficacy. Scores on the ESOCreP administered at the start of the treatment were regressed against grade level, sex, years in the Triad gifted program, and previous Type III's completed in order to determine factors that contribute to self-efficacy as a creative producer before interventions were attempted. Results are reported in Table 12.

With all variables entered in the regression equation, the multiple R was .1482, with an R2 of .0220. Approximately 2% of the variance in initial self-efficacy was accounted for by grade, sex, years in the Talent Pool, and previous Type III's completed.

When the significance standard of .05 was applied to the standardized beta weights of all the variables, sex and years in the Talent Pool did not meet the criteria, with betas of -.005 and -.021 respectively. These variables were eliminated and the regression was run again with the remaining variables. This time the multiple R was .1590, with an R2 of .0253. Results of this regression are shown in Table 13. The F test showed no significant loss of explanatory power with the trimmed model, so it was accepted as the more parsimonious explanation.

Summary discussion of research question 3. While Bandura's theories that those with a higher degree of self-efficacy were more likely to attempt the behavior and that interventions could increase self-efficacy and subsequent engagement in the behavior were not contradicted by the results obtained in the current research, neither were they strongly supported. Previous number of Type III's proved to have a much stronger influence on initiation of Type III's than did self-efficacy. The simple correlation between efficacy and initiation of III's was a positive but low .15 (Table 14), so it is doubtful that previous III's took away much in the form of shared variance by entering the equation first.

Combining both direct and indirect (through self-efficacy) effects of treatment on initiation of Type III's yields .122, indicating a very moderate effect on the outcome variable. It would appear that the mini-course treatment did not play a major role in inspiring students to begin Type III's. Other factors such as locating a topic of interest, finding time, etc. may have played larger roles in these decisions. On the other hand, the treatment did have some effect on students' decisions to begin Type III's, so if other benefits of the mini-course can be demonstrated it may still be of practical significance to continue the course, perhaps after modification.

About half of the students in the sample began Type III projects before the start of the mini-course. This reduced the number of students in the sample for the third research question concerning impact of the treatment on post-treatment efficacy and subsequent initiation of Type III's. If all students were used in the analysis

of post-treatment efficacy, the effects of treatment would be confounded by the effects of participation in a Type III for those students who were involved in one. Since it is likely that students who start the year with ideas and motivation to undertake a Type III differ in relevant ways from those who do not, the results of the third research question may not apply to those who initiated Type III's early in the school year.

## Discussion

### Predictors of Self-efficacy

There was support for the causal model at all but the initial stage. Final efficacy was positively and significantly related to earlier measures of self-efficacy and participation in a Type III, indicating stability of the construct and increases in efficacy as a result of participation in the behavior.

The greatest influence on post-treatment self-efficacy was initial self-efficacy, measured approximately six weeks earlier. Beyond that, however, participation in the treatment did have a significant ($p<.05$) influence on efficacy for the whole group and a non-significant one for the students who had not started a Type III before the mini-course. The fact that these were negative indicates that participation in the treatment was associated with lower subsequent efficacy scores. It could be that students found the research activities hard and emerged from the experience feeling less confident. Though Bandura suggests that successful completion of a behavior leads to higher efficacy, Goldfried and Robins (1982) found that participants' subjective evaluations influence efficacy more than objective performance. It is also possible that students who viewed Type III's differently from the approach presented in the mini-course might have questioned their abilities to do a research-oriented Type III.

The causal model for initial efficacy did not provide an adequate explanation. While the direction and relative magnitude among the variables was consistent with self-efficacy theory, the overall amount of variance predicted was small. It may be that students need more familiarity with a scale measuring self-efficacy before completing it, or that a more effective scale is needed. Since performance accomplishments were significant predictors in other parts of the model, it may be that these events need to take place within a shorter time of completion of the scale for them to influence self-efficacy for children. It may also be that the more ambiguous the behavior under study, the less direct the link between specific performance accomplishments and efficacy.

In general, the causal model tracing the influences of and on self-efficacy was consistent with Bandura's theory. Further influences on initial self-efficacy and starting a Type III exist outside the model and warrant further investigation.

### Effect of Treatment

The research methodology mini-course was intended to provide students with a successful experience learning about and doing several elements of research that would be applicable to Type III projects. These included the formulation of research questions and hypotheses, gathering data through interviews, survey, and participation in an experiment, and interpretation of the data in

order to answer the original research question. In self-efficacy terminology, this would provide students with successful performance accomplishments which are hypothesized to lead to increases in self-efficacy and subsequent initiation of the target behavior. Neither of those expectations occurred in the current study; indeed the relationship between efficacy and treatment was negative. It is worth speculating about causes for the negative relationship for what they may suggest for further research on self-efficacy.

While it is possible that the treatment was not effective because it was too short or did not include appropriate activities, this would not account for a negative correlation between the treatment and post-treatment self-efficacy. One interpretation is that students in the control group had an inflated sense of efficacy about their ability to do first hand research, because it has never been tested. Students in the treatment group had a chance to actually participate in research, which allowed them to more realistically assess their ability to perform the behavior. If this is the case, an important factor in future self-efficacy research that must be considered is the extent of participants' experiential basis for making initial efficacy judgements.

It may also be that the term Type III represents too great a diversity of options to design a treatment applicable to all. While the mini-course certainly included skills applicable to some Type III projects, it is very far removed from other kinds, e.g. writing a play, researching an historical event, or composing music. For this reason, participation in the treatment might not have contributed to the self-efficacy of students who held a different view of Type III's. It may have even reduced their sense of efficacy if they felt unsuccessful at doing the activities of the mini-course and felt that this type of research was what was expected in a Type III.

Because the same analysis was done with the entire sample and the sub-set of students who had not previously started a Type III, it might be interesting to compare the effects. In both cases the relationship was a negative one, with treatment having a path coefficient of -.097 for the entire sample ($p<.05$) and -.099 for the sub-set (n.s.). Participation in the treatment seems to have had about the same effect on the self-efficacy of students who did not start III's earlier as it did on the entire sample.

A third possibility is that the failure of the treatment to have a statistically significant effect on either self-efficacy or Type III initiation could have resulted from the brevity of the research methodology mini-course. Teachers were given four 50 minute lessons about elements of the research process described above. In addition, students were to conduct interviews, a written survey, and group experiment. This involvement may have been either too short or too shallow to allow students to develop significant increases in self-efficacy.

Finally, students in both treatment and control groups were constantly being exposed to verbal persuasion, vicarious experiences (seeing others involved in Type III projects), and performance accomplishments through process skill training and Type III projects. The presence of these other elements, said to also promote increased self-efficacy, may have overwhelmed the effect of the treatment.

The rationale was that if students were given methodological

tools and helped to see uses for them, they would be more likely to initiate independent investigations. Anecdotal information indicates that finding a topic of interest is a critical precursor to initiation of Type III's. It is possible that students did not see a connection between the particular skills learned in the mini-course and topics of interest to them, or that they had not found a topic of enough interest to warrant beginning a Type III project. Because students in the Talent Pool have a wide range of interests and talents, it is also possible that the particular skills taught in the mini-course did not have applicability to many students' interests and abilities. Therefore students might not have seen the relationship between what was done in the mini-course and the initiation of Type III projects when the Type III topics were unrelated to the mini-course content.

Instrumentation

A relatively low stability reliability (.56) resulted in a smaller amount of systematic variance in self-efficacy available for analysis, which may have obscured the true relationship among the variables under study. The low stability estimates could be explained by the fact that students at the time of the reliability study were participants in Triad programs and, as such, were being exposed to experiences designed to encourage them to initiate Type III projects. Approximately 40% of the students were involved in Type III projects during the six weeks; in addition, students were exposed to the modeling of others doing Type III's and to verbal persuasion, both theoretical contributors to self-efficacy. Therefore, even though students were not exposed to the treatment designed to affect self-efficacy, by virtue of their membership in the Triad gifted program they were in an environment containing several other elements that are said to have an impact on self-efficacy. It is conceivable that these other elements affected students' self-efficacy as creative producers, resulting in greater than expected variance in the test-retest measures. The alternative of doing the stability study with non-Triad students was rejected because that sample would not have been representative of the target population and would not have been familiar with the terminology used on the instrument.

Another statistical limitation was the restriction of range of the self-efficacy scores. On the three administrations of the efficacy scale, the mean scores ranged from 28 to 28.9 with a maximum score possible of 36. The standard deviation was between four and six, resulting in a severely negatively skewed distribution of scores. While the skewness was corrected by transforming the data, the restriction of range would result in a smaller amount of variance available for correlation with other variables. Because regression procedures are based on correlations, the true relationship between efficacy and the other variables may have been masked even further by this reduction in systematic variance available for analysis.

Other Influences on Self-efficacy

Goldfried and Robins (1982) suggest that people's subjective impressions of a behavior may have more influence on their sense of efficacy than objective successes or failures at the behavior. Given the perception that gifted students may experience perfectionism, it would be valuable to investigate the relationship of self-efficacy

judgements to both subjective and objective ratings of performance among gifted and non-gifted students. If gifted students do indeed indicate lower subjective ratings of their performance than is objectively justified, this may account for a lower sense of self-efficacy and subsequent lower motivation to pursue an activity they did not feel confident to complete perfectly.

Another area for investigation is the extent to which peoples' self-efficacy judgements are influenced by their perceptions of others' performances. Would efficacy be lower for a member of a group where most others did Type III's of outstanding quality; conversely might they be higher if the projects of others were less impressive? It is possible that people in group situations base their self-efficacy judgements in part against the performances of others, making their self-efficacy estimations in a norm-referenced way. Another perspective is that people may use the performances of peers to form their own conceptualization of the task before they estimate their own self-efficacy to perform that task.

Self-efficacy Vis-a-vis Complex Target Behaviors

This study found weaker relationships between self-efficacy measures and Type III projects than did earlier studies involving other kinds of behaviors. While this may have resulted from measurement properties (restricted range and reduced systematic variance from low test-retest reliability), it seems important to consider an alternative explanation. Previous research about self-efficacy has generally involved behaviors that are narrow and clearly defined. Examples include holding a rubber snake (Bandura, Adams, & Beyer, 1977), doing arithmetic computation (Schunk, 1981, 1982, 1983, 1984), not smoking (DiCLemente, Prochaska, & Gibertini, 1985), and following the Weight Watcher diet program (Mitchell & Stuart, 1984). The current research deals with a topic that is both narrow and broad. While Type III's have a specific meaning in the context of Triad gifted programs, it is also true that a wide range of possible behaviors is encompassed. Students have engaged in scientific experimentation, music composition, telescope building, historical research, social change, fashion design, and many other projects.

There is also a range of extensiveness and quality with which one can do a Type III, which is not the case for the narrower behaviors that have been the subject of previous self-efficacy research. Fashion design can involve just sitting down and sketching clothing, or it could involve research about historical fashions, characteristics and costs of modern fabrics, lifestyles of potential customers, market research, etc. In order to make efficacy judgements, the subject must make some assessment of task difficulty, which would seem to be easier with more circumscribed and clear cut behaviors. When behaviors involve a greater possible range for both scope and quality, the person's conception of the task becomes a confounding variable in judging self-efficacy. If one has a notion of a Type III as a random sample survey involving hundreds of respondents, pretesting of an instrument, and statistical analysis of the results, a person could feel much less efficacious about doing it than another who envisions it as passing out a written survey in three homerooms and adding up the results. Indeed, given the same view of the task, the first person might feel much more efficacious than the second.

The problem comes when we ask subjects to make self-efficacy judgments about tasks and are not aware of how they conceptualize the task. One solution is to only ask about precise, concrete behaviors that are dichotomous, ones people either do or don't do. While this would probably increase internal validity, it puts severe limitations on the areas one could investigate. Since most behaviors of importance in life are neither precise nor dichotomous, it would seem important to relate self-efficacy to tasks with degrees of quality, if that is even possible. It might be necessary to provide more thorough task descriptions or ask respondents to describe the task they envision before they make self-efficacy judgements. It seems important, however, to control for variations in perceived task difficulty among respondents.

## Summary

This study investigated creative productivity and self-efficacy within the context of gifted programs based on the Triad model, which has as its goal the facilitation of creative productivity in students. In this context, support was found for reciprocal links between self-efficacy as creative producer and initiation of Type III projects. Because students in Triad gifted programs are continually exposed to a variety of experiences designed to encourage their involvement in Type III projects, the positive relationship found in this study between self-efficacy and creative productivity might not be found with students who do not receive the many services of Triad programs which are designed to stimulate creative productivity. The treatment, which would be more generalizable, did not result in significant increases in self-efficacy or Type III's.

The construct of self-efficacy holds much promise for the field of education in general and education of the gifted in particular. Some work has been done regarding factors affecting elementary students' sense of self-efficacy (Schunk, 1981, 1982, 1983, 1984, 1985) and teachers' sense of self-efficacy (Ashton, 1984; Ashton & Webb, 1986; Berman, et al., 1977; Gibson & Dembo, 1984). It is hoped that there will be further investigation in the field of education in general and with gifted students in particular.

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## APPENDIX A

### Efficacy Scale for Overall Creative Productivity (ESOCreP)

Name:_____ Date:_____

School:_____ Grade:_____

Think about how confident you feel about doing each of these things. It doesn't matter if you have ever done them or not. Think about each one and circle the number that shows your confidence to do each one.

**********

Not Confident Very Confident

1 2 3 4 5 6

I'm sure I could not do it. I'm sure I could do it.

**********

1 2 3 4 5 6 (a) Completing a Type III project.

1 2 3 4 5 6 (b) Doing a project that is more advanced than most kids my age would do.

1 2 3 4 5 6 (c) Working on a project that wasn't a class assignment if it was about something I was interested in.

1 2 3 4 5 6 (d) Finding out information or doing research most kids my age couldn't do.

1 2 3 4 5 6 (e) Working on a project on my own or with the help of the teacher of the gifted.

1 2 3 4 5 6 (f) Improving something in my school, town, or world that could be better.

Table 1

Sample Population

| School | Grade Levels | n in Control | n in Treatment |
|---|---|---|---|
| K. M. Elementary | 5,6 | 14 | 20 |
| C. S. Elementary | 4,5 | 17 | 22 |
| E. Elementary | 4,5,6 | 16 | 18 |
| T. Elementary | 5,6 | 7 | 5 |
| W. Elementary | 4,5,6 | 11 | |
| N. Elementary | 4,5,6 | | 18 |
| L. Middle School | 5,8 | 21 | 22 |
| V. Junior High | 7,8 | 64 | 39 |
| TOTALS | | 150 | 144 |
| | 4 - 8 | 294 | |

Table 2

Summary Statistics for the Hierarchical Multiple Regression of Type III's Started After Treatment on Four Variables

| Variable | Step | Mult R | R sq. | Adjusted R sq. | F of Equation | F of Change |
|---|---|---|---|---|---|---|
| Grade | | | | | | |
| Sex | 1 | .2325 | .0540 | .0426 | 4.714** | 4.714** |
| Prev III | | | | | | |
| Yrs.in TP | 2 | .4026 | .1621 | .1415 | 7.881*** | 10.505*** |
| Treatment | 3 | .4163 | .1733 | .1478 | 6.791* | 2.200 |

*p<.05. **p<.01. ***p<.001.

Correlation Matrix for Variables in the Regression

| | IIIafter | Grade | Sex | PrevIII | Yrs.TP | Treatment |
|---|---|---|---|---|---|---|
| IIIafter | 1.000 | .180 | -.155 | .387 | .316 | .098 |
| Grade | | 1.000 | -.048 | .421 | .445 | -.265 |
| Sexa | | | 1.000 | -.128 | -.068 | .104 |
| Prev III | | | | 1.000 | .779 | .036 |
| Yrs. TP | | | | | 1.000 | .036 |
| Treatmentb | | | | | | 1.000 |

a Female = 0, male = 1.

b Control = 0, treatment = 1.

Table 3

Summary Statistics for the Regression of Final Self-efficacy on the Postulated Predictor Variables

| Variable | Unstandardized Beta | Standardized Beta | Standard Error of Beta | F of Change |
|---|---|---|---|---|
| Post-treatment efficacy | .567 | .504 | .064 | 192.74*** |
| Participation in a Type IIIa | .531 | .280 | .091 | 34.70*** |
| Initial self-efficacy | .228 | .167 | .076 | 9.106** |
| Constant | .818 | | | |

R=.754 R2 =.569 S.E. est.=.636

a In instances where reflexed self-efficacy scores have been compared to other variables, signs have been reversed in order to conform to the original measurements.

**p<.01. ***p<.001.

Table 4

Intercorrelations for Variables in the Causal Model

| | Final s/eff | Post-Tr. s/eff | Initial s/eff | III |
|---|---|---|---|---|
| Final s/eff | 1.000 | .690 | .517 | .481 |
| Post-tr. s/eff | | 1.000 | .571 | .324 |
| Initial s/eff | | | 1.000 | .224 |

| | III | Prev. | T.Pool | Sex | Grade | P/t s/e |
|---|---|---|---|---|---|---|
| III | 1.000 | .302 | .257 | -.063 | -.002 | .291 |
| Prev. III | | 1.000 | .769 | -.104 | .345 | .113 |
| Tal. Pool | | | 1.000 | -.078 | .396 | .120 |
| Sex | | | | 1.000 | -.009 | .122 |
| Grade | | | | | 1.000 | -.104 |

| | Post-tr. s/eff | Initial s/eff | Treatment |
|---|---|---|---|
| Post-tr. s/eff | 1.000 | .698 | .029 |
| Initial s/eff | | 1.000 | .176 |

| | Init. s/e | Grade | Sex | PrevIII | T.Pool |
|---|---|---|---|---|---|
| Initial s/e | 1.000 | -.080 | .055 | .058 | .038 |
| Grade | | 1.000 | -.032 | .290 | .369 |
| Sex | | | 1.000 | -.112 | -.093 |
| Prev. III | | | | 1.000 | .752 |

Note. In instances where reflexed self-efficacy scores have been compared to other variables. signs have been reversed in order to conform to the original measurements.

Table 5
Summary Statistics for the Regression of Participation in Type III's on the Postulated Predictor Variables

| Variable | Unstandardized Beta | Standardized Beta | F of Error of Beta | Change |
|---|---|---|---|---|
| Post-treatment self-efficacy a | .152 | .254 | .037 | 18.263*** |
| Previous III's | .078 | .246 | .030 | 23.234*** |
| Grade | -.031 | -.088 | .024 | 1.540 |
| Sexb | -.065 | -.064 | .062 | 1.113 |
| Yrs. T.Pool | .016 | .067 | .024 | .471 |
| Constant | 1.004 | | | |

R = .412 R2 = .170 S.E. est. = .459

a Signs for reflexed self-efficacy scores have been reversed in order to conform to the original measurements.

b Female = 0, male = 1. ***p<.001

Table 6
Summary Statistics for the Regression of Post-treatment Self-efficacy on the Postulated Predictor Variables

| Variable | Unstandardized Beta | Standardized Beta | F of Error of Beta | Change |
|---|---|---|---|---|
| Initial self-eff. | .819 | .716 | .053 | 229.45*** |
| Treatment | -.162 | -.097 | .077 | 4.39* |
| Constant | .318 | | | |

R = .705 R2 = .497 S.E. est. = .594

Note. In instances where reflexed self-efficacy scores have been compared to other variables, signs have been reversed in order to conform to original measurements.

*p<.05 ***p<.001

Table 7
Summary Statistics for the Regression of Initial Self-Efficacy on the Postulated Predictor Variables

| Variable | Unstandardized Beta | Standardized Beta | F of Error of Beta | Change |
|---|---|---|---|---|
| Grade | -.059 | -.110 | .036 | 1.638 |
| Prev III's | .037 | .078 | .045 | 1.856 |
| Sex | .094 | .062 | .094 | .988 |
| Yrs. Tal. Pool | .010 | .026 | .037 | .069 |
| Constant | 2.661 | | | |

R = .133 R2 = .018 S.E. est. = .740

Note. In instances where reflexed self-efficacy scores have been commpared to other variables, signs have been reversed in order to conform to the original measurements.

a Female = 0, male = 1.

Table 8
Summary Statistics for the Regression of Initial Self-Efficacy Scores on Variables in the Trimmed Model

| Variable | Unstandardized Beta | Standardized Beta | F of Error of Beta | Change |
|---|---|---|---|---|
| Grade | -.072 | -.150 | .032 | 3.670 |
| Prev III's | .046 | .109 | .028 | 2.250 |
| Sexa | .104 | .077 | .085 | 1.478 |
| Constant | 2.546 | | | |

R = .172 R2 = .029 S.E. est. = .653

Note. In instances where reflexed self-efficacy scores have been compared to other variables, signs have been reversed in order to conform to the original measurements.

a Female = 0, male = 1.

Table 9

Summary Statistics for the Regression of Type III's Started After the Treatment on the Postulated Predictor Variables

| Variable | Unstandardized Beta | Standardized Beta | Standard Error of Beta | F of Change |
|---|---|---|---|---|
| Prev. III's | .097 | .337 | .024 | 28.274*** |
| Sexa | -.147 | -.151 | .072 | 2.839 |
| Post s/eb | .066 | .116 | .042 | 2.365 |
| Treatment | .116 | .123 | .073 | 2.396 |
| Grade | .011 | .033 | .030 | .149 |
| Yrs. T.Pool | | .004c | | |
| Constant | .302 | | | |

R = .440 R2 = .194 S.E. est. = .434

a Female = 0, male = 1.

b In instances where reflexed self-efficacy scores were compared to other variables, signs have been reversed in order to conform to original measurements.

c Even with criteria for entry relaxed to .9, years in the Talent Pool did not enter the regression equation. This value came from data given for variables not in the equation.

***p<.001

Table 10
Summary Statistics for the Regression of Type III's Started After Treatment on the Variables in the Trimmed Model

| Variable | Unstandardized Beta | Standardized Beta | F of Error of Beta | Change |
|---|---|---|---|---|
| Prev III's | .102 | .355 | .021 | 28.886*** |
| Sexa | -.144 | -.148 | .071 | 2.747 |
| Post s/eb | .067 | .119 | .042 | 2.511 |
| Treatment | .104 | .110 | .069 | 2.298 |
| Constant | .377 | | | |

R = .441 R2 = .194 S.E. est. = .431

a Female = 0, male = 1.

b In instances where reflexed self-efficacy scores have been compared to other variables, signs have been reversed in order to comform to original measurements.

***p<.001

Table 11
Summary Statistics for the Regression of Post-treatment Self-efficacy on the Postulated Predictor Variables

| Variable | Unstandardized Beta | Standardized Beta | F of Error of Beta | Change |
|---|---|---|---|---|
| Initial s/e | .743 | .627 | .073 | 99.799*** |
| Treatment | -.169 | -.099 | .105 | 2.562 |
| Constant | .601 | | | |

R = .6193 R2 = .3836 S.E. est. = .677

Note. In instances where reflexed self-efficacy scores have been compared to other variables, signs have been reversed in order to conform to the original measurements.

***p<.001

Table 12

Summary Statistics for the Regression of Initial Self-Efficacy on the Postulated Predictor Variables

| Variable | Unstandardized Beta | Standardized Beta | Standard Error of Beta | F of Change |
|---|---|---|---|---|
| Grade | -.079 | -.154 | .046 | 1.410 |
| Yrs. in Talent Pool | .036 | .111 | .042 | 2.011 |
| Prev. III's | .009 | .021 | .054 | .027 |
| Sexa | | .005b | | |
| Constant | 2.605 | | | |

R = .148 R2 = .022 S.E. est. = .691

Note. In instances where reflexed self-efficacy scores were compared to other variables, signs have been reversed in order to conform to the original measurements.

a Female = 0, male = 1.

b Even with criteria for entry relaxed to .9, sex did not enter the regression equation. The standardized beta came from data given for variables not in the equation.

Table 13

Summary Statistics for the Regression of Initial Self-Efficacy Scores on Variables in the Trimmed Model

| Variable | Unstandardized Beta | Standardized Beta | Standard Error of Beta | F of Change |
|---|---|---|---|---|
| Yrs. in Talent Pool | .053 | .157 | .028 | 1.608 |
| Grade | -.075 | -.141 | .044 | 2.889 |
| Constant | 2.690 | | | |

R = .159 R2 = .025 S.E. est. = .715

Note. In instances where reflexed self-efficacy scores have been compared to other variables, signs have been reversed in order to conform to the original measurements.

Table 14

Intercorrelation of Variables Examined in Research Question 3

| | III's after | Sex | Prev III's | Treat-ment | Grade | Post-tr s/eff | Yrs. TPool |
|---|---|---|---|---|---|---|---|
| IIIa | 1.000 | -.165 | .391 | .119 | .158 | .147 | .318 |
| Sex | | 1.000 | -.109 | .088 | -.047 | .120 | -.059 |
| Prev | | | 1.000 | .051 | .439 | .139 | .795 |
| Treatment | | | | 1.000 | -.276 | .016 | .036 |
| Grade | | | | | 1.000 | .030 | .444 |
| Post treatment s/eff | | | | | | 1.000 | .177 |

| | Post-treatment Self-efficacy | Initial Self-efficacy | Treatment |
|---|---|---|---|
| Post-treatment self-efficacy | 1.000 | .612 | -.004 |
| Initial Self-efficacy | | 1.000 | .152 |

| | Post-trtmt. Self/effic | Prev. III's | Grade | Yrs in Tal. Pool | Sex |
|---|---|---|---|---|---|
| Post tr. s/e | 1.000 | .042 | -.095 | .057 | .004 |
| Prev. III | | 1.000 | .425 | .777 | -.178 |
| Grade | | | 1.000 | .455 | -.087 |
| Yrs Tal. Pool | | | | 1.000 | -.101 |

Note. In instances where reflexed self-efficacy scores have been compared to other variables, signs have been reversed in order to conform to the original measurements.

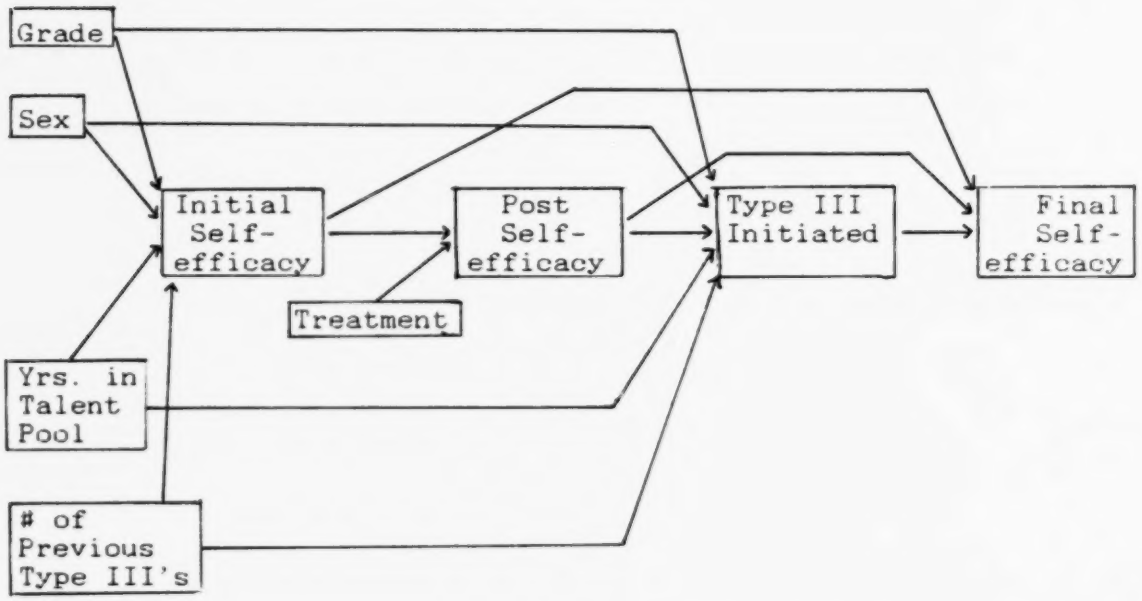


Figure 1. Hypothesized nine-variable path model for predicting self-efficacy as creative producer.

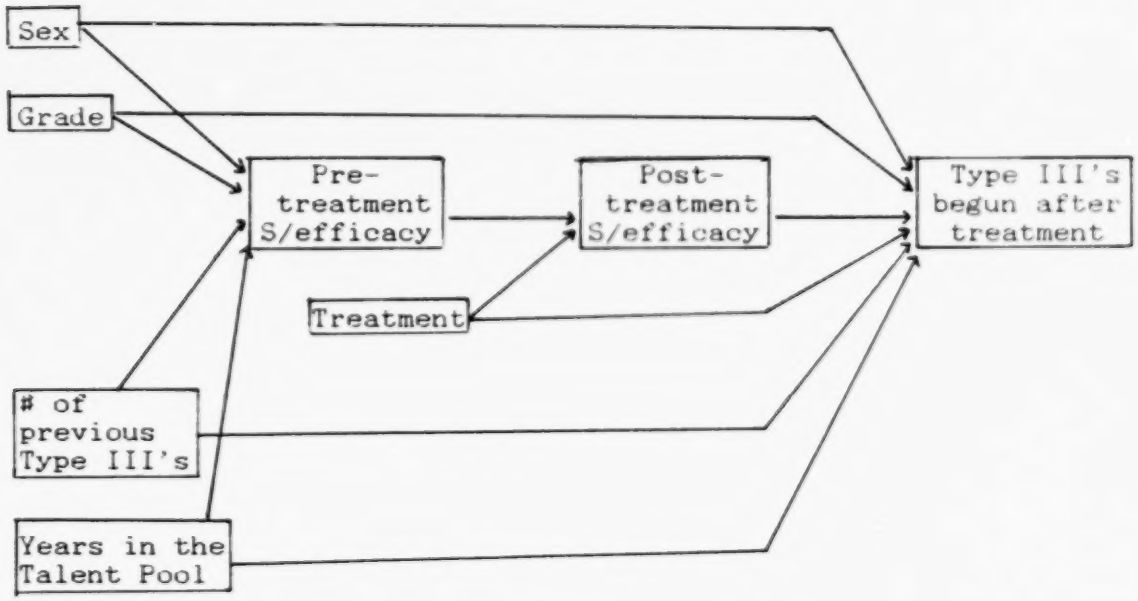


Figure 2. Hypothesized nine variable path model for predicting initiation of Type III projects after treatment.

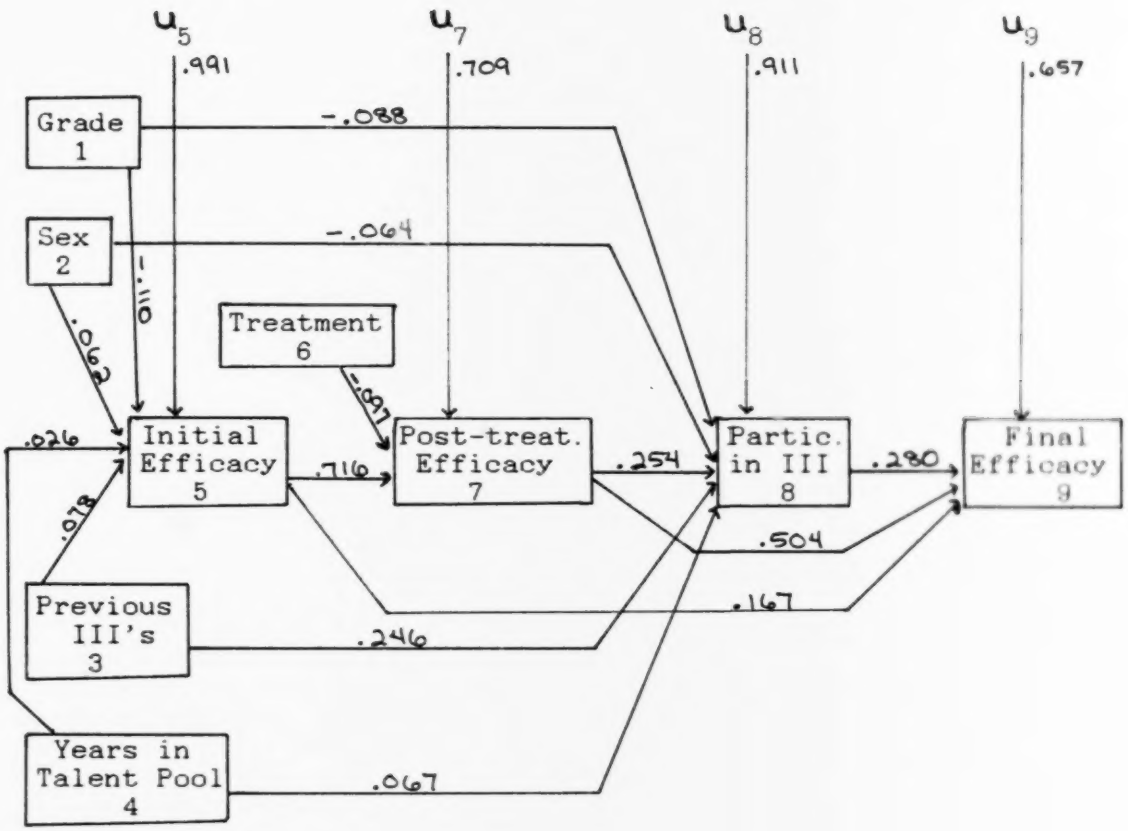


Figure 3. Nine variable path model for predicting final self-efficacy as creative producer. Numbers on the paths are path coefficients. $U_5$ through $U_9$ represent residual causes not accounted for in the path model for each causal element, where $U_5$ through $U_9 = \sqrt{1-R^2}$

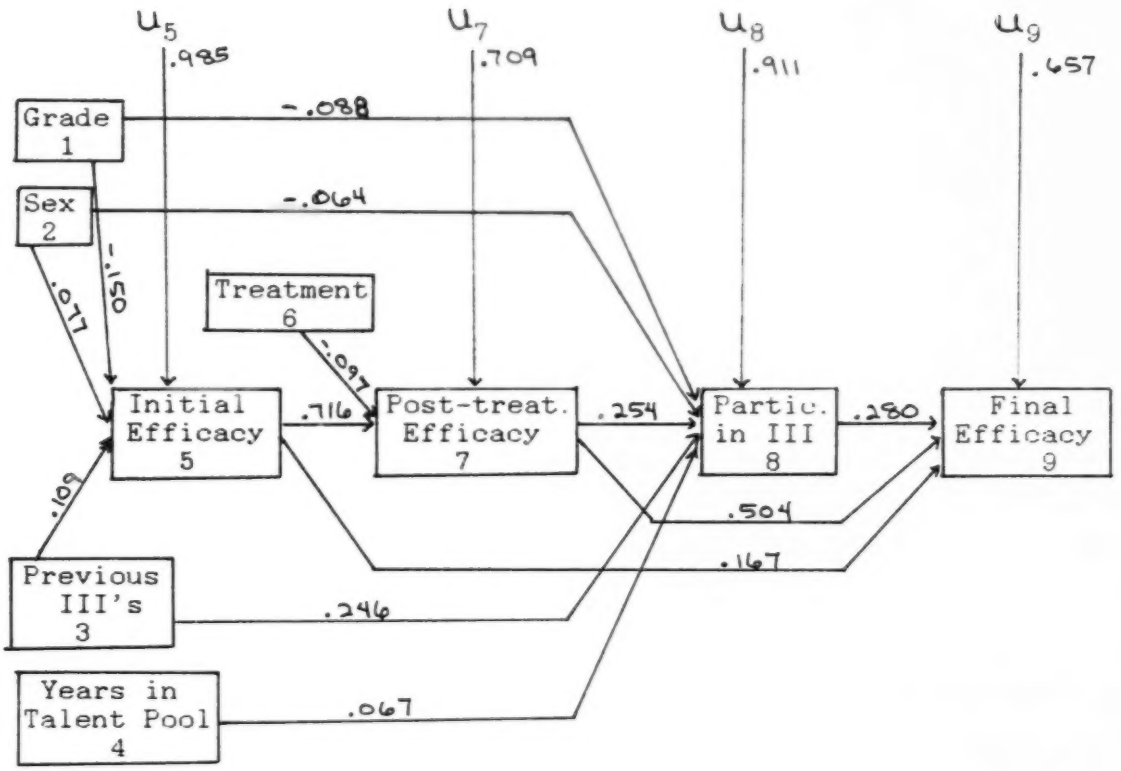


Figure 4. Trimmed nine variable path model for predicting final self-efficacy as creative producer. Numbers on the paths are path coefficients. $U_5$ through $U_9$ represent residual causes not accounted for in the path model for each causal element, where $U_5$ through $U_9 = \sqrt{1 - R^2}$.

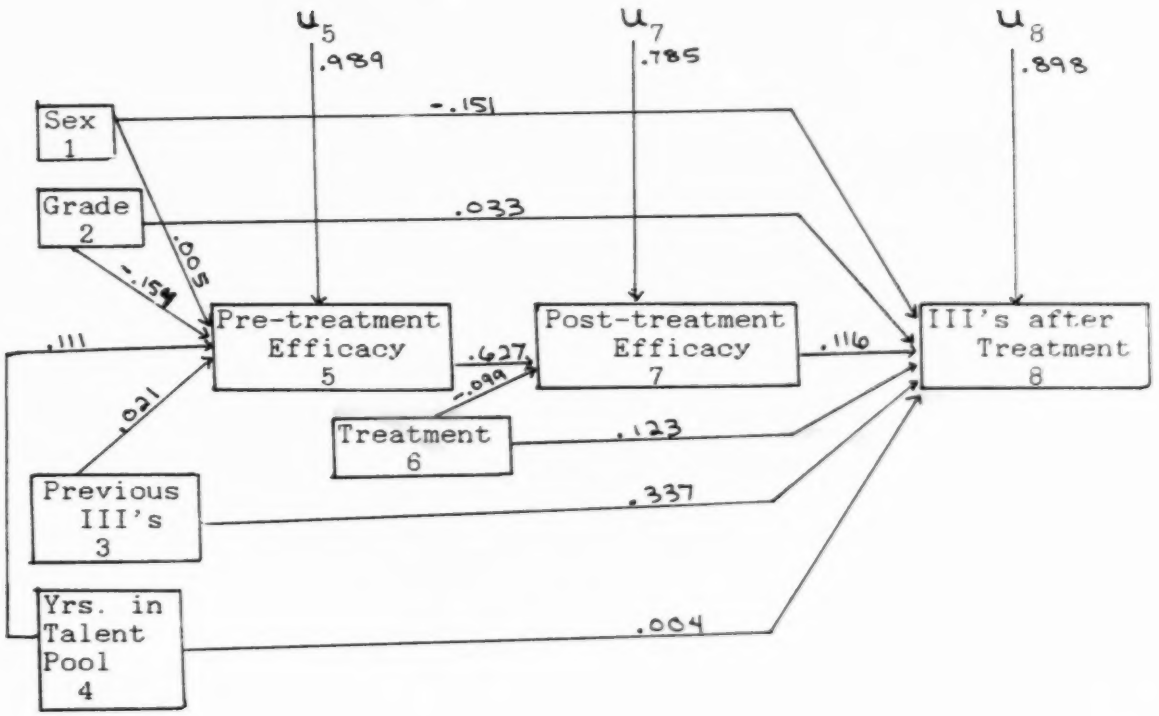


Figure 5. Eight variable path model for predicting starting of Type III's after treatment. Numbers on the paths are path coefficients. $U_5$ through $U_9$ represent residual causes not accounted for in the path model for each causal element, where $U_5$ through $U_9 = \sqrt{1-R^2}$.

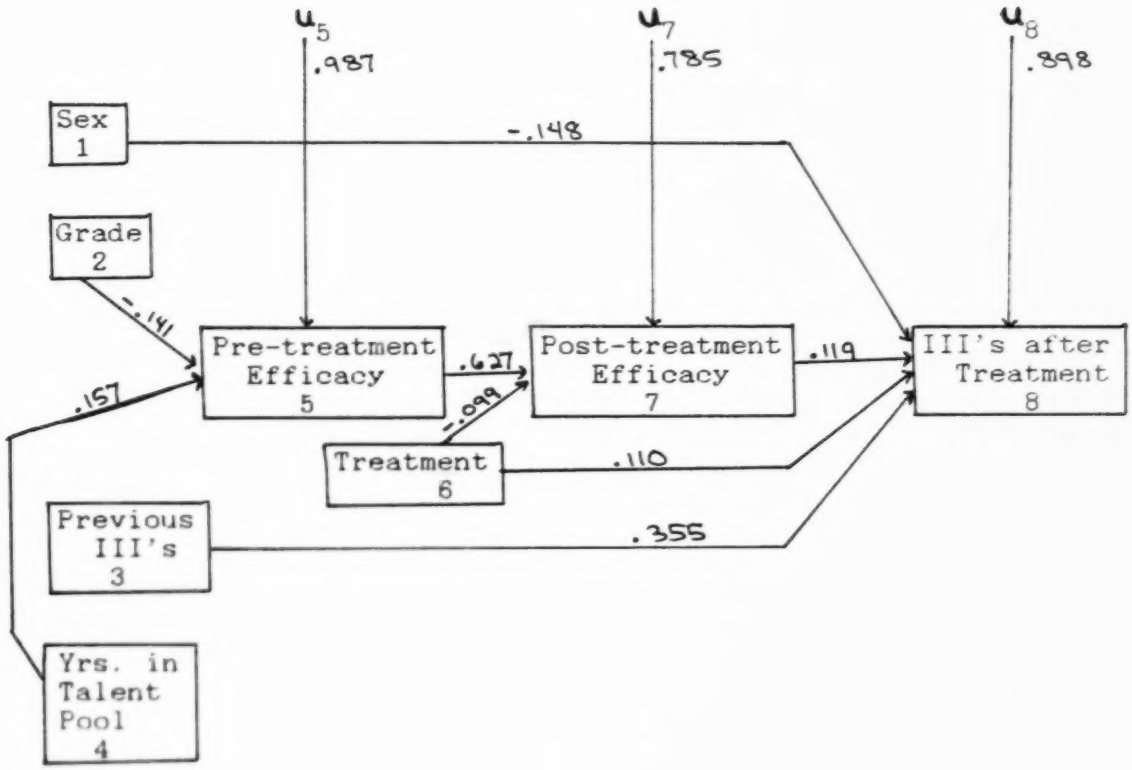


Figure 6. Trimmed eight variable path model for predicting starting of Type III's after treatment. Numbers on the paths are path coefficients. $U_5$ through $U_9$ represent residual causes not accounted for in the path model for each causal element, where $U_5$ through $U_9 = \sqrt{1-R^2}$.